usually hunts by smell and not by sight, and when food is put into the tank it does not swim straight towards it, as many other fishes (*e. g.*, cod) do, but rushes wildly about with its pelvic fins spread out at right angles to the body until it brushes against it. The evidence, however, is not sufficient to decide whether these organs are purely tactile or whether they are used in the same way as similar structures in the higher vertebrates.

My best thanks are due to Professor M'Intosh for his kindness in supplying material and for many helpful suggestions.

EXPLANATION OF PLATE V.

Fig. 1. Left pelvic fin of *Onus mustela*, 5 millim. in length.
Fig. 2. Ditto, 20 millim. in length.
Fig. 3. Ditto, 23 millim. in length.
Fig. 4. Ditto, 32 millim. in length.
Fig. 5. Transverse section of pelvic fin of *Onus*, 23 millim. in length. *ep.*, epithelium; *fr.*, dermal fin-rays; *n.c.*, nerve-cord; *pg.*, pigment.
Fig. 6. Pelvic fin of a specimen 98 millim. in length.
Fig. 7. Transverse section of the foregoing.
Fig. 8. Free ray of ditto in section, more highly magnified.
Fig. 9. Epithelium of ditto, high power.
Fig. 10. Sense-organ.

Figs. 1, 2, 3, 4, and 6 are not drawn to scale. The actual size of these is represented by the line underneath each.

Reference letters.

bs.=basement membrane.
ct.=cuticle.
dr.=dermal fin-ray.
ep.=epithelium.
mp.=Malpighian layer.
n.c.=nerve-cord.
s.o.=sense-organ.
t.=connective tissue.

XVII.—*Notes and Descriptions of some* Dynastidæ *from Tropical America, chiefly supplementary to the 'Biologia Centrali-Americana.'* By Gilbert J. Arrow, F.E.S.

I.—*On Central-American Species of the Genus* Cyclocephala.

Although thirty-five described species of *Cyclocephala* are enumerated by H. W. Bates in the 'Biologia Centrali-Americana,' this probably forms scarcely more than a fraction of those actually inhabiting Central America. The British Museum collection already contains about a dozen additional species, and, as certain corrections have to be made to the

conclusions expressed in the above work, I have thought it best to prepare a short supplementary paper. I have omitted certain species which it seemed could be more adequately described when further specimens have been received.

The specimens ascribed by Bates to *Cyclocephala mutata* represent four distinct although closely related species, those from Yucatan only being the true *C. mutata* (*C. frontalis*, Burm.). Two of the Costa-Rican specimens belong to *C. sororia*, Bates, while the remainder of the extra-Mexican individuals constitute a new species and those from the northern part of Mexico another.

Cyclocephala marginicollis, sp. n.

Testacea, cylindrica, immaculata, tarsis suturaque tenuissime rufescentibus; capite rufo-fusco, vertice nigro, clypeo lato, vix producto, rugoso (♂ subtilissime), vertice crebre punctato; prothorace sat lato, nitido, leviter punctato, ubique linea incisa marginato, lateribus fortiter arcuatis, angulis anticis acutis, posticis curvatis; scutello paulo punctato, signa Y-formi vage impresso; elytris grosse lineato-punctatis, ♀ lateribus post medium dilatatis; pygidio, ♂ fere opaco, subtilissime punctato, ♀ subnitido, distincte inæqualiter punctato.

Long. 16–18 mm.

Hab. Mexico, Cordova, Playa Vicente.

This species and *C. mutata*, G. & H., are extremely close to one another. The true *C. mutata*, however, seems to be confined to Yucatan, from which State it was described. Seven specimens from there in our collection have enabled me to separate the two forms, being entirely devoid of a marginal line at the posterior border of the pronotum, whereas in the new species it is very distinct. The only other differences which I am able to find are the absence in *C. mutata* of the Y-shaped depression on the scutellum, which is more or less visible in the northern form, and the absence of punctures on the posterior part of the head.

Cyclocephala lævicauda, sp. n.

Cylindrica, pallide testacea, elytris pellucidis; capite pygidioque rufo-fuscis, vertice nigro; abdomine, tibiis tarsisque rufescentibus; clypeo lato, vix producto, subtiliter rugoso, vertice mediocriter punctato; prothorace polito, parce et minute punctato, postice immarginato, lateribus valde arcuatis, angulis anticis subacutis, posticis curvatis; scutello vix punctato; elytris lævissime lineato-punctatis, ♀ lateribus post medium dilatatis; pygidio politissimo.

Long. 15–17 mm.

Hab. Costa Rica, San José, La Palma, Irazu; Panama, Chiriqui.

This differs from the two species just distinguished by its more pellucid and lightly punctured elytra and its dark, very smooth pygidium. The thorax is without a posterior marginal line. From *C. sororia*, Bates, to which it has a very close superficial resemblance, it is distinguished by its shorter and broader clypeus, which is not punctured but finely rugose, its less punctured elytra and impunctate pygidium. The females are at once recognizable by the lateral expansion of the elytra, which is absent in *C. sororia*. In the latter species the marginal line of the thorax loses its constancy, our series showing every transition from a complete condition to its entire obliteration behind.

The North-American *C. immaculata*, Oliv., has been recorded by Bates from Cordova in Southern Mexico, on the strength of a single specimen which proves to be specifically distinct, though nearly related. The species must therefore be supposed to range no further southwards than Northern Mexico, a single specimen only having occurred so far south as Lerdo.

The other species is here described:—

Cyclocephala fusciventris, sp. n.

Ovata, testacea, vertice, abdomine, thoracis disco utrinque punctisque elytrorum duobus post medium fusco-rufis; capite crebre rugoso, clypeo magnitudinis mediocre, subtruncato; prothorace sat crebre punctato, linea media lævi, lateribus regulariter curvatis, angulis posticis obliteratis, anticis acutis; scutello punctato; elytris leviter costatis, grosse punctatis; pygidio subtiliter rugoso et setoso.

Long. 12·5 mm.

Hab. S. Mexico, Cordova.

The dark markings of the upper surface are only faintly indicated in our specimen, but the fuscous abdomen immediately distinguishes it from *C. immaculata*, in which the abdomen is very pale. The pygidium is very coarsely punctured in that species, whereas in the present one it is very finely rugose. The clypeus of *C. fusciventris* is rather larger and the club of the male antenna is less elongate.

Cyclocephala acuta, sp. n.

Testacea, capite, abdomine elytrorumque basi et sutura infuscatis; capite medio rufo-maculato, sat crebre punctato, clypeo magno,

apice acuto; prothorace polito, subtilissime punctato; scutello lævi; elytris lineato-punctatis.

♀ elytrorum marginibus post medium explanatis, fusco maculatis; pygidio acuminato, polito, vix punctato.

Long. 15 mm.

Hab. Costa Rica, Plains of Corredor.

A single female specimen, found by M. Pittier de Fabrega, has been sent to us. It belongs to the "*signata*" group, but is quite unique from the very peculiar form of its clypeus, which is sharply pointed in front.

Cyclocephala prolongata, sp. n.

Elongata, testacea, capite, prothoracis maculis duabus discoidalibus, sutura maculisque elytrorum nigris: capite elongatissimo, antice crebre strigoso-punctato, postice fere lævi, clypeo antice arcuato, oculis parum prominentibus; prothorace polito, subtiliter punctato, longitudine ad latitudinem æquali, antice valde attenuato, angulis posticis curvatis; scutello vix punctato; elytris haud perspicue punctatis.

♀ pygidio lævi, opaco, medio acuminato; elytrorum marginibus paulo ante apices plicatis, indentatis.

Long. 15–20 mm.

Hab. British Honduras.

We have received a number of specimens of this at different times, all of them females, the greater number having been collected by the Rev. J. Robertson. This also is a quite isolated form, although belonging to the same group as the last. The remarkable elongation of the head and thorax is not found in any other species I know, and the conical prolongation of the pygidium, which will probably be found to characterize the female sex only, is also very peculiar. The black vittæ on each side of the middle line of the prothorax appear to be almost constant, but the elytral ornament is extremely variable. In most of our specimens this consists, in addition to the narrow sutural line, only of a small spot on each side below the scutellum; but these may enlarge and unite into a large triangular patch enclosing the scutellum, while an outer bar may appear extending obliquely inwards from the humeral callus.

Cyclocephala discicollis, sp. n.

Testacea, fronte, prothorace (lateribus exceptis), abdomine elytrorumque vittis quatuor (2 superioribus externis, 2 inferioribus internis) infuscatis; capite strigoso-punctato, clypeo lato, apice angulariter emarginato; prothorace nitido, sparse punctato,

lateribus æqualiter curvatis; scutello punctato; elytris sat grosse punctatis: ♀ elytrorum marginibus post medium explanatis, infuscatis; pygidio punctato-rugoso: ♂ pygidio opaco, subtilissime rugoso et setoso.

Long. 13 mm.

Hab. Panama, La Chorrera; Venezuela.

A specimen of this from Reiche's collection bears the unpublished name of *discicollis*. The species belongs to the same section of the genus as those just preceding. It is closely related to *C. microspila*, Bates, another Panama species, which M. Biolley has recently sent from Costa Rica. *C. discicollis*, however, has the clypeus more distinctly emarginate, is a trifle smaller, and considerably more marked with brown. The four elytral marks, reduced to dots in *C. microspila*, form elongate dashes, the suture is dark, and in the female the marginal expansion of the elytra also. The pronotum, with the exception of the lateral margins and probably an occasional pale middle line, is dark and the abdomen is tinged with brown.

Cyclocephala sparsa, sp. n.

Breviter ovata, testacea, capite nigro, prothorace elytrisque omnino nigro-sparsis, clypeo parvo, arcuato, fusco-rufo; capite prothoraceque crebre at distincte punctatis, hoc valde transverso, angulis anticis acutis, posticis obliteratis; scutello punctato; elytris confluenter punctatis, punctis inæqualibus; pygidio rugoso-punctato, subtiliter setoso: ♀ elytrorum margine post medium leviter angulato, haud explanato.

Long. 14 mm.

Hab. Mexico, Playa Vicente.

A single female from Playa Vicente was acquired by Messrs. Godman and Salvin from the Sallé collection, and a pair of the same species from "Mexico (Secata)" have been since 1854 in the British Museum. It is related to *C. 14-punctata*, Mann., but is peculiar in having the thorax and elytra splashed irregularly with small black spots. Among these are more or less distinguishable six larger spots upon the elytra, forming with the scutellum an almost perfect circle. The single female in our collection is more thickly speckled than the two males. The front tibiæ are armed with two acute terminal teeth, situated close together, and a third placed before the middle, which is very minute but separated by a very deep notch.

II.—*A Revision of the Genus* Lycomedes *and its Allies.*

Three of the six species hitherto assigned to *Lycomedes* are Central American, while of the ten members of the group now known to me all appear to be confined to the mountain chain between Nicaragua and Ecuador; for, although *L. Mniszechi*, Thoms., was recorded as from Mexico, it has only since been found (by Belt) at Chontales in Nicaragua, and from the restricted range of the other species and the describer's failure to give a precise habitat for the original specimen, this may be regarded, I think, as only an approximation to the actual home of the species.

My attention was first called to the necessity for a revision of the genus by Mons. René Oberthür, who pointed out to me that the form assigned by Bates in the Central-American monograph to *Lycomedes Mniszechi*, Thoms., was distinct from that species, of which the type is in the Oberthür collection. M. Oberthür has since kindly sent me all his specimens of the group, and as I have thus had before me the types of all the described species (all but the one just mentioned being in our own collection), it has seemed to me advisable, while re-characterizing the Central-American forms, to tabulate the distinctive features of all. In so doing I have found all the species range themselves into two very distinct series, for which two generic names are already in existence.

The typical species of *Lycomedes* (*L. Reichei*) was described in 1844 by De Brême, and three years later Burmeister published a description of an insect which he regarded as De Brême's species and which he received from Dupont with the unpublished name of *luridipennis*. Another large male he saw in the Hope collection, and to this he attached the name *Spodistes luridipennis*, Burm., under which he originally described the species, but substituted that of *Lycomedes Reichei* before publication. Upon examination of the last-mentioned specimen, I have found that it is entirely distinct from *L. Reichei*, and very near, but not the same as, that described shortly afterwards by Thomson. These two, with the two others figured in the 'Biologia Centrali-Americana,' form a generic group for which it will be convenient to retain the name *Spodistes*.

In tabulating the characters of the subdivisions of the Dynastidæ, Lacordaire has distinguished the Agaocephalinæ, to which these insects belong, by the absence of a prosternal process. In *Lycomedes* proper this is really strongly deve-

loped, but in the species which I associate under the name of *Spodistes* (none of which were known to Lacordaire) it is entirely absent. Associated with this feature is the form of the thoracic horn. In *Lycomedes* it is vertical or even directed somewhat backwards, and is not pointed, but broad and more or less compressed from back to front. It is channelled down the middle, so as to appear as if formed from two fused lateral horns. The prothorax in both sexes is very transverse.

In *Spodistes* the horn is directed horizontally forward, as in the other allied genera, is curved, and tapers to a point. The prothorax in the male is considerably narrower than the elytra.

This genus forms a connecting-link therefore between *Lycomedes* on the one hand and *Agaocephala* and *Mitracephala* on the other. From the last it differs chiefly by the velvety clothing of its upper surface and the narrowed prothorax of the male.

The following are the most salient features of all the species of *Lycomedes* and *Spodistes* yet known to me:—

Genus Lycomedes.

Cephalic horn toothed at base:	
basal tooth large, bifid	*ramosus*, sp. n.
basal tooth small	*Reichei*, De Brême.
Cephalic horn bilaminate at base:	
legs velvety	*velutipes*, sp. n.
legs pilose	*hirtipes*, sp. n.
Cephalic horn unarmed at base:	
bifid at apex	*Burmeisteri*, Waterh.
trifid at apex	*Buckleyi*, Waterh.

Genus Spodistes.

Cephalic horn toothed near base:	
simple at apex	*beltianus*, Bates.
bifid at apex	*Batesi*, sp. n.
Cephalic horn unarmed at base:	
bifid at apex	*Mniszechi*, Thoms.
trifid at apex	*Hopei*, sp. n.

Lycomedes ramosus, sp. n.

Griseo-olivaceus, fusco-nebulosus, velutinus; cantho oculari acute producto; elytris subdepressis, latis, vix perspicue punctatis, nebulosis, callis apicalibus prominentibus; pedibus partim velutinis, longe flavo-setosis.

♂, capite cornu valido, ramoso, extremitatibus utrisque bifidis, thorace cornu erecto, brevi, canaliculato, munitis; pronoti lateri-

bus sinuatis, post medium valde angulatis, angulis anticis acutis, posticis fere rectis.
Long.* 30 mm., lat. 17 mm.

Hab. Colombia, Bogota.

A single male specimen was included in the collection bequeathed to the Museum by the late Philip Crowley, and is the only representative of the species at present known. It is the finest of its genus, both from the great development of its doubly-branched cephalic horn and the conspicuous marbling of its upper surface. The prosternum is raised into a basin-shaped structure behind the coxæ.

Lycomedes velutipes, sp. n.

Rufo-fuscus, fulvo-griseo-velutinus, vix variegatus; elytris subdepressis, lineato-punctatis, callis apicalibus haud prominentibus, cantho oculari truncato producto.

♂, capite cornu valido, fortiter bifurcato, baseos lateribus laminate elevatis, thorace cornu valido, oblique erecto, antice et postice haud profunde canaliculato, munitis; pronoti lateribus post medium fortiter angulatis, angulis anticis acutis, posticis obtusis; femoribus tibiisque velutinis, parce flavo-setosis.
Long. 32 mm., lat. 19 mm.

Hab. Ecuador, Chimbo, La Chima.

This species was found by M. de Mathan, from whom M. Oberthür received four specimens. By the latter's kindness it is now represented in our collection. It is a closely allied form to the Colombian *L. Burmeisteri*, Waterh., but the cephalic horn is stouter and more strongly bifurcated, with its edges raised at the base into two parallel ridges. The elytra are less diversified in colour and their puncturation is more apparent. The prosternal process also is more strongly developed. In *L. Burmeisteri* it is only slightly prominent and forms a conical tubercle thickly clothed with hairs. In *L. velutipes* it is produced considerably beyond the coxæ and is trumpet-shaped and naked.

Lycomedes hirtipes, sp. n.

Minor, rufo-fuscus, fulvo-griseo-velutinus; elytris variegatis, irregulariter punctatis, callis apicalibus prominentibus; tibiis tarsisque haud velutinis, longe fulvo-setosis; cantho oculari acute producto.

* The length of these insects is measured from the front margin of the clypeus to the extremity of the abdomen, the cephalic horn being excluded.

♂, capite cornu valde curvato et bifurcato, baseos lateribus paulo elevatis, thorace cornu mediocre, oblique erecto, munitis; pronoti lateribus sinuatis, medio valde angulatis, post medium leviter excisis, angulis anticis minute productis, posticis obtusis.

Long. 27 mm., lat. 15 mm.

Hab. COLOMBIA (*Sallé*), Manizales (*Patino*).

This species was labelled *L. Reichei* in the Sallé collection. It is closely allied to that form as well as to *L. Burmeisteri* and *L. velutipes*. The first, in addition to the acute tooth at the base of the cephalic horn, has a pinkish tint, which distinguishes it from all others. The pygidium is also very protuberant and the apical callosities of the elytra are acute. The latter, though less prominent in *L. hirtipes*, are more so than in either of the two other species mentioned above, from both of which the present species is also distinguished by the clothing of its legs, which is not velvety, but thickly hairy. The cephalic horn has its edges elevated at the base, but much less so than in *L. velutipes*. Both sexes may be distinguished also by the elytra, which are variegated and irregularly punctured. The prosternal process is prominent and formed as in the preceding species, but is less expanded and hollowed at its extremity, the edges of which are thickly pilose.

I have seen about a dozen specimens of this species.

Spodistes Batesi, sp. n.

Rufo-fuscus, fulvo-griseo-velutinus, haud variegatus; cantho oculari haud producto; elytris subdepressis, haud perspicue punctatis, callo apicali prominente; corpore subtus pedibusque (tarsis exceptis) omnino velutinis, parce setosis.

♂, capite cornu bifido, intus canaliculato, basi plus minusve dentato, thorace cornu gracili, acuto, antice directo, munitis; pronoto angusto, lateribus postice fere parallelis, latitudine elytrorum dimidio æquali.

Long. 28 mm., lat. 16 mm.

Hab. PANAMA, Volcan de Chiriqui.

The numerous examples of this collected by Mr. Champion were confused by Bates with *L. Mniszechi*, Thoms., of which the Godman-Salvin collection contained a single male specimen from Nicaragua. This specimen agrees exactly with Thomson's type, and both differ from the Panama form by their broader thorax, the acutely produced ocular canthus, and the entire absence of any inner tooth on the cephalic horn. This tooth is formed in *L. Batesi* at the lower extremity of a slight channel upon the inner face of the horn. The channel is

visible in all conditions of development of the horn, and although Bates states that in the least-developed specimens the tooth disappears entirely, there is always a slight prominence to mark the termination of the channel. The prosternum, as in all the forms which I have referred to *Spodistes*, is not elevated behind the coxæ. The figure in the Biol. Centr.-Amer. is useless for the recognition of this species.

Spodistes Hopei, sp. n.

Rufo-fuscus, fulvo-griseo-velutinus, haud variegatus, cantho oculari minute obtuse angulato; elytris subdepressis, vix perspicue punctatis.

♂, capite cornu valido, apice bifido, ante apicem intus dentato, thorace cornu acuminato, curvato, haud longo, munitis; pronoto paulo lato, lateribus antice et postice convergentibus.

Long. 33 mm., lat. 19 mm.

Hab. Colombia, New Granada.

The type is the specimen in the Hope Collection referred to by Burmeister under the name of *Lycomedes Reichei*. As already mentioned, Burmeister's description does not apply to that species, and it is even possible that the specimens from the Hope and Dupont collections, from which his description was formulated, are not specifically the same, as a tooth is mentioned at the base of the cephalic horn, whereas in the Hope specimen it is situated a little before the apex. In all other respects Burmeister's description applies to this form. I have seen in M. Oberthür's collection a second male specimen which formerly belonged to M. Sallé.

It will be of interest to describe here a second species of the closely-allied genus *Brachysiderus*, as it appears to indicate an even nearer relationship with the foregoing genera than has been hitherto supposed. The type specimen of this genus is now in M. Oberthür's collection, but through his kindness I have been able to compare it with a female of the same species in our collection and with the type of the following description:—

Brachysiderus paranensis, sp. n.

Rufo-fuscus, elytris testaceis, sutura, marginibus extremis callisque humeralibus et apicalibus infuscatis; cantho oculari extus acute angulato; prothorace grosse punctato, lateribus irregulariter curvatis, angulis posticis distinctis; scutello grosse rugoso; elytris crebre punctatis, interstitiis vix punctulatis.

♂, capite cornu curvato, bifurcato, apicibus haud divergentibus, armato; prothorace antice medio minute bituberculato; pygidio tumido, nitido, irregulariter punctato.
Long. 31 mm., lat. 18 mm.

Hab. Brazil, Castro (Parana Prov.).

A single male specimen in our collection and an almost identical one in that of Mr. O. E. Janson were collected by Mr. E. D. Jones. The species is similar to *B. quadrimaculatus*, Waterh., in form and coloration, but the cephalic horn is not perceptibly narrower at the base than at the apex, the canthus is not produced forwards, but outwards, there is a rudiment of a thoracic horn, and the thorax is uniformly dark in colour. The disc is much more coarsely punctured than in the other species, and the elytra do not show the thick interstitial puncturation of that form.

XVIII.—*Notes on the Classification of Teleostean Fishes.*—III. *On the Systematic Position of the Genus* Lampris, *and on the Limits and Contents of the Suborder* Catosteomi. By G. A. Boulenger, F.R.S.

That extraordinary-looking pelagic fish, the Opah or King-fish (*Lampris luna*), which, from its great size and brilliant colours, always excites much curiosity when landed on our coasts, has hitherto invariably been placed not far from the Mackerels, Scombridæ, or, at least, in the division Scombriformes. Although attention has repeatedly been drawn to the many points in which this fish differs from all Scombriformes, even the most advanced of recent reformers of classification, whilst expressing their doubts as to the propriety of maintaining it in that division, have not ventured to depart from a tradition based solely upon resemblances of the most superficial kind.

An analysis of the characters of *Lampris* at once shows a combination which should exclude it not only from the Scombriformes, but also from the suborder to which that division belongs. The fins are absolutely devoid of spines, the ventrals are abdominal in position and formed of a great number of rays—15 to 17 *,—the mouth is bordered by the maxillaries in addition to the præmaxillaries, if not to a great extent, at least quite as much as in the Scombresocidæ, this

* We have to look back to the Ganoids and the lowest Teleosteans (Elopidæ and Albulidæ) to meet with anything like so high a number.